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Analytical approximation of ⟨φ2⟩ for a massive scalar field in static spherically symmetric spacetimes

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Abstract

An analytical approximation of ⟨φ 2⟩ for a massive scalar field in a zero-temperature vacuum state in static spherically symmetric spacetimes is obtained. The calculations are based on the method for computing vacuum expectations values for scalar fields in general static spherically symmetric spacetimes derived by Anderson, Hiscock, and Samuel. The analytical approximation is used to compute ⟨φ 2⟩ in Schwarzschild and wormhole spacetimes. ©2000 The American Physical Society.